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PAPERS

IN

CHEMISTRY.

CHEMISTRY.

The GOLD MEDAL of the Society was this Session voted to Sir H. C. ENGLEFIELD, Bart. of Tilney-street, for his Discovery of a LAKE from MADDER; from whom the following COMMUNICATION was received.

SIR,

AFTER many experiments on the red pigment to be prepared from madder, I have obtained from it a colour far superior to any which I have ever seen produced from it. I have received from many of our most distinguished artists very satisfactory reports of its excellence. I mean to make my process public; and if it should be consistent with the views of the Society of Arts, &c. to publish it, and they should think the improvement I have made

made worthy of a Premium, I shall be much flattered by their approbation.

I shall be much obliged to you by a line in answer; and am, Sir,

Your obedient Servant,

H. C. ENGLEFIELD.

Tilney-street, May-Fair, Dec. 15, 1803.

CHAS. TAYLOR, Esq.

THE want of a durable red colour, which should possess something of the depth and transparency of the Lakes made from cochineal, first induced me to try whether the Madder root, which is well known to furnish a dye less subject to change by exposure to air, than any other vegetable colour, except indigo, might not produce something of the colour I wanted.

Several of the most eminent painters of this country have, for some time, been in the habit of using madder lakes in oil pictures: but the colours they possessed under this name were either a yellowish

yellowish red, nearly of the hue of brick-dust, or a pale pink opake, and without clearness or depth of tint, and quite unfit to be used in water-coloured drawing, which was the principal object of my search.

My first attempts were to repeat the process given by Margraf, in the Memoirs of the Academy of Berlin: but the colour produced by this mode was of a pale red, and very opake, although the eminent author of the process states the colour he produced to be that of "*le sang enflammé*," which probably means a deep blood colour. It may, however, be observed, that colours prepared with a basis of alumine will appear much deeper when ground in oil than they do in the lump, the oil rendering the alumine nearly transparent. This advantage is, however, lost in water-colours. On examining the residuum of the Madder root, after it had been treated in Margraf's method, it appeared tinged with

with so rich a red, that it was obvious, that by far the greater part of the colour still remained in it, and that the most powerful and beautiful part. To extract this, several ineffectual trials were made, which it would be useless to enter into; but, on attentively examining the appearances which took place on infusing the Madder in water, I began to suspect that the red colouring matter was very little, if at all, soluble in water, and that it was only mechanically mixed with the water when poured on the root, and suspended in it by the mucilage, with which the root abounds.

A very small quantity, therefore, can be obtained by any infusion or decoction, as the greater part sinks down on the root, or remains with it on the sieve, or in the bag, through which the infusion or decoction is passed to render it clear. I therefore was induced to try whether, by some merely mechanical means,

means, I could not separate the colouring matter from the fibrous part of the root. In this attempt my success was fully equal to my hopes; and, after several trials, I consider the process I am now about to describe, as the most perfect I have been able to discover.

Process 1.

Enclose two ounces, troy weight, of the finest Dutch madder, known in commerce by the name of crop madder, in a bag, capable of containing three or four times that quantity, and made of strong and fine calico. Put it into a large marble, or porcelain mortar, and pour on it about a pint of cold soft water. The Thames water, when filtered, is as good as can be used; it being very nearly as pure as distilled water, at least when taken up a very little way above London. With a marble or porcelain pestle, press the bag strongly in every

every direction, and, as it were, rub and pound it as much as can be done without endangering the bag. The water will very soon be loaded with the colouring matter, so as to be quite opake and muddy. Pour off the water, and add another pint of fresh water to the root, agitating and triturating it in the manner before described; and repeat the operation till the water comes off the root very slightly tinged. About five pints of water, if well agitated and rubbed, will extract from the root nearly the whole of its colour; and if the residual root be taken out of the bag and dried, it will be found to weigh not more than five drachms, apothecaries weight; its colour will be a kind of light nankeen, or cinnamon, and it will have entirely lost the peculiar odour of the root, and only retain a faint woody smell.

The water loaded with the colouring matter, must be put into an earthen or well-

well-tinned copper, or, what is still better, a silver vessel, (for the use of iron must be carefully avoided through the whole), and heated till it just boils. It must then be poured into a large earthen or porcelain bason, and an ounce troy weight of alum dissolved in about a pint of boiling soft water, must be poured into it, and stirred until it is thoroughly mixed. About an ounce and a half of a saturated solution of mild vegetable alkali should be gently poured in, stirring the whole well all the time. A considerable effervescence will take place, and an immediate precipitation of the colour. The whole should be suffered to stand till cold; and the clear yellow liquor may then be poured off from the red precipitate. A quart of boiling soft water should again be poured on it, and well stirred. When cool, the colour may be separated from the liquor by filtration through paper in the usual way; and boiling water should be

be poured on it in the filter, till it passes through of a light straw colour, and quite free from any alkaline taste. The colour may now be gently dried; and when quite dry, it will be found to weigh half an ounce; just a fourth part of the weight of the madder employed.

By analysis, this colour possesses rather more than 40 per cent. of alumine. If less than an ounce of alum be employed with two ounces of madder, the colour will be rather deeper; but if less than three quarters of an ounce be used, the whole of the colouring matter will not be combined with alumine. On the whole, I consider the proportion of an ounce of alum to two ounces of madder, as the best.

Process 2.

If, when the solution of alum is added to the water loaded with the colouring matter of the root, the whole be

be suffered to stand, without the addition of the alkali, a considerable precipitation will take place, which will be of a dark dull red. The remaining liquor, if again heated, will, by the addition of the alkali, produce a rose-coloured precipitate of a beautiful tint, but wanting in force and depth of tone.

This is the process recommended by Mr. Watt, in his Essay on Madder, in the *Annales de Chymie*, *Tome* 7; and this latter colour is what may perhaps, with propriety, be called Madder Lake. But, although the lighter red may be excellent for many purposes, yet I consider the colour produced by the union of the two colouring matters, as given in the first process, as far preferable for general use, being of a very beautiful hue when used thin, and possessing unrivalled depth and richness either in oil or water, when laid on in greater body.

If but half an ounce of alum be added to the two ounces of the root, the first precipitate will be nearly similar

to that when an ounce is employed; but the second, or lake precipitate, will be less in quantity, and of a deeper and richer tint. In this case the whole of the colouring matter, as before observed, is certainly not combined with the alumine; for, on adding more alum to the remaining liquor, a precipitate is obtained of a light purplish red. In this process, when two ounces of madder and an ounce of alum are used, the first precipitate has about 20 per cent. of alumine, and the second, or lake precipitate, about 53 per cent.; but these proportions will vary a little in repetitions of the process.

Process 3.

If the madder, instead of being washed and triturated with cold water, as directed in the foregoing process, be treated in exactly the same manner with boiling water; the colour obtained will be rather darker, but scarcely of so good

good a tint; and the residuum of the root, however carefully pressed and washed, will retain a strong purplish hue; a full proof that some valuable colour is retained in it, probably fixed in the woody fibre by the action of heat. Mr. Watt, in his excellent Treatise on Madder above mentioned, observes, that cold water extracts the colour better than hot water; and I have reason to suspect, that a portion of that colouring matter, which produces the bright red pigment, distinguished before by the name of Madder Lake, remains attached to the root, when acted on by boiling water.

Process 4.

If to two ounces of madder, a pint of cold water be added, and the whole be suffered to stand for a few days (three or four days) in a wide-mouthed bottle, lightly corked, in a temperature of between 50° and 60°, and often shaken; a slight fermentation will take place,

the infusion will acquire a vinous smell, and the mucilaginous part of the root will be in a great degree destroyed, and its yellow colour much lessened. If the whole be then poured into a calico bag, and the liquor be suffered to drain away without pressure, and then the root remaining in the bag be heated with cold water, &c. exactly as directed in the first process, the red colouring matter will quit the root with much greater ease than before fermentation. It will also be equal in quantity to that afforded by the first process, but of a much lighter red. This difference of tint appears to be owing to a destruction of a part of the lake by the fermentation of the root; for if the colours from the fermented root be obtained separate, as in Process 2, the first precipitate will not sensibly differ from that obtained from the unfermented madder, but the second, or lake, will be of a very light pink. This process, then, is not to be recommended.

Spanish

Spanish and Smyrna Madders.

Spanish Madder affords a colour of rather a deeper tone than the Dutch Madder, but it does not appear to be of so pure a red as the Zealand Crop Madder.

The Smyrna Madder is a very valuable root. The colour produced from it by Process 1, is of a deeper and richer tint than any I have obtained from the Dutch Madder. The quantity produced from two ounces, is only three drachms, twenty-four grains: but this is not to be wondered at; for as this madder is imported in the entire root in a dry state, and the Crop Madder of Zealand consists principally of the bark, in which probably the greatest part of the colouring substance resides, there is every reason to think that the Smyrna Madder really contains a greater proportion of colour than the Zealand, in equal weights of the entire root.

The products of Process 2 prove, that the *lake* of the Smyrna Madder is more abundant in quantity, and of a richer tone than that of the Dutch root; for, from two ounces of Dutch Madder the first precipitate was two drachms, and the lake was two drachms and forty-eight grains; whereas, from two ounces of the Smyrna root the first precipitate was one drachm and twenty-four grains, and the lake was two drachms and twenty-four grains. The proportion of the lake to the other colour is, therefore, much higher in the Smyrna, than in the Dutch root.

Fresh Madder.

The colour may be prepared from the recent root; and it will be of a quality equal, if not superior, to any other. The difficulty of procuring the fresh root has prevented me from making as many experiments on it as I could have wished. I procured, however, a small quantity of the best roots packed in moss from Holland,

Holland, and the following process answered perfectly well.

Eight ounces of the root having been first well washed and cleaned from dirt of all kinds, were broken into small pieces, and pounded in a bell-metal mortar, with a wooden pestle, till reduced into an uniform paste. This paste being enclosed in a calico bag, was washed and triturated, as described in the first process, with cold water. About five pints seemed to have extracted nearly the whole of the colour. To the water thus loaded with colour, and boiled as before, one ounce of alum, dissolved in a pint of boiling water, was added, and the alkali poured on the whole, till the taste of the mixture was just perceptibly alkaline. The colour thus obtained, when dry, was of a very beautiful quality.

The success of this experiment, which was twice repeated with the same result, has led me to hope, that it is not

impossible that the mode of obtaining the colour from the fresh root here described, may be productive of advantages for more extensive use than I had in view when first I attempted to obtain a pigment from madder. Many tracts of land in this country are as well adapted to the growth of this valuable article, as the soil of Holland can be; and the cultivation of it, which has more than once been attempted to a considerable extent, has been laid aside, principally from the expense attendant on the erection of drying-houses and mills, and the great expense and nicety requisite for conducting the process of drying. But should the colour prepared in the mode just described, be found to answer the purposes of the dyers and calico-printers, the process is so easy, and the apparatus required for it so little expensive, that it might be in the power of any grower of the root to extract the colour: besides which,

which, another great advantage would be obtained; the colour thus separated from the root, may be kept any length of time, without danger of spoiling, and its carriage would be only one fourth of that of the root I am, moreover, thoroughly inclined to believe, that in the present mode of using the root, a very considerable part of the colour is left in it by the dyers; and, should this prove to be the case, an advantage much greater than any hitherto adverted to, may arise from the process here recommended.

Should it be attempted to obtain the colour from the fresh root, on an extensive scale, I should recommend, that the root be first reduced to as uniform a pulp as possible, by grinding or pounding. To this purpose, it is probable that the cyder-mill would answer perfectly well; and its extreme simplicity is a great recommendation. For the purpose of trituration, bags of woollen,

len, such as are used in the oil-mills, would probably answer as well as calico, and they would be much cheaper and more durable. A large vat, with stampers, would be easily constructed, by those who are conversant in mechanicks, for the holding them and pressing them in water; and when the colour was boiled and precipitated, the flues of the boilers might easily be formed into convenient drying tables, without any additional expense of fuel. The part of the process, which I consider as of the greatest importance, and as being the essential advantage of my methods over all those which have come to my knowledge, is the trituration or pressing of the root in water; and I believe that the colouring matter of the root has not been hitherto considered as so nearly insoluble in water, as I have reason to think it is.

It were much to be wished, that in the present advanced state of Chemistry, some

some skilful analyser would investigate the properties of this very useful root; in which perhaps it will be found, that there are three, if not four, different colouring substances. Such are the processes and views, which I have thought it not improper to submit to the consideration of the Society of Arts, &c.

I have only now to describe the specimens which accompany this Paper; assuring the Society, that they have been all prepared by my own hands entirely, and that I am therefore responsible for their having been produced by the processes stated, without the addition of any foreign matter whatever, excepting the cake ground up with gum, and the bladder of oil-colour, which were prepared from the colour which I gave him, by Mr. Newman, of Soho-square, whose skill and fidelity are too well known to need any testimony in their favour.

It may be proper to add, that all the colours produced from the Dutch Madder were prepared from the same parcel of Crop Madder, in order that the differences in them might proceed from the processes, and not from a variation in the qualities of the root, which, in different specimens, will produce different shades of colour under the same mode of treatment.

1. Dutch Madder, treated by Process 1st.
2. Ditto ..... Process 2d.
3. Ditto ..... Process 3d.
4. Ditto ..... Process 4th.
5. Dutch Madder, two ounces; alum, half an ounce; treated by Process 2.
6. Dutch Madder, two ounces; alum, one ounce; fermented two days, and then treated by Process 2.
7. Produce of Process 1, ground in gum by Mr. Newman.
8. Produce of Process 1, ground in oil by Mr. Newman.

S—1. Smyrna Madder, by Process 1.
S—2. Ditto ..... Process 2.
S—3. Ditto ..... Process 3.
S—4. Ditto ..... Process 4.

CERTIFICATES

CERTIFICATES accompanied the foregoing description, from Mr. Cotman and Mr. Munn, testifying the merits of Sir H. Englefield's Madder Lakes, as water-colours; and also from Messrs. West, Trumbull, Opie, Turner, Daniel, and Hoppner, speaking greatly in its favour, where it has been tried in oil-colours.

The

The GOLD MEDAL of the Society was this Session voted to Dr. WILLIAM DYCE, of Aberdeen, for his Discovery of a MINE of MANGANESE; from whom the following COMMUNICATION was received.

SIR,

AS it seems to be the professed purpose of the institution of the Society of Arts, &c. to encourage any discovery, that may either directly or indirectly facilitate the progress of the useful arts; I beg leave to intimate to them a discovery which I have made, of no small importance to the extensive cotton, linen, and thread manufactures in this country:—it is a very fine vein of Manganese, of immense extent, which I have opened in the neighbourhood of this

this town, and have been now working it for these six weeks past. It yields about twenty tons per week, which gives employment to twelve men. I need hardly mention to the Society, that the oxygenated muriatic acid, either singly or combined in the process of bleaching, is of very extended, and almost universal use; nor shall I urge the advantages resulting to the manufacturer by adopting this method; but I must beg leave to mention, that this acid cannot be prepared at so cheap a rate from any other substance hitherto known, as from the black oxyd of Manganese. The immense demand of late, however, for this article, has, somehow or other, considerably enhanced its price, perhaps in consequence of the general use of the new method of bleaching: but I am told that the chief cause is owing to the veins in England being nearly exhausted, or that the mineral is more difficult to be procured from the hills than

formerly. In either case, however, it is an object of some consequence to the manufacturer to be able to be regularly supplied with the pure oxyd, and at a reasonable rate. Should the Society think the above information worthy of their notice, I shall be happy to have it in my power to give them whatever further information they may require, and at the same time, if agreeable, I shall forward a small cask, containing what quantity they may please to mention as a specimen.

I have the honour to be,

SIR,

Your most obedient Servant,

WM. DYCE, M.D.

Aberdeen, July 13, 1802.

CHAS. TAYLOR, Esq.

SIR,

SIR,

THE favour of yours of the 14th of February, in answer to mine of the 13th of July last, I received; and should have given an earlier acknowledgment to the favourable reception which the Committee of Chemistry were pleased to bestow on my communication respecting the Manganese, had not my other avocations, combined with a strong desire to afford all the information I could collect, prevented me.

With this, therefore, you will please to present to the Society the small cask of Manganese formerly mentioned. The quality of it is such as I should call fine, that is, if a certain quantity of the mineral be taken as it comes from the mine; various matters, as clay, granite, calcarious spar, barytes, &c. are mixed and strongly adhere to it, which lessens the quantity of oxygen to be derived

from a given quantity of the ore, and of course makes it less valuable. These foreign matters, therefore, must be separated, first by washing off the loose particles; and then by a hammer, which in general detaches a considerable portion of Manganese along with them. These, however, are not lost; for, by a little further trouble in separating as much as may be of the stony or foreign particles, another quality of Manganese is constituted, which is sold generally at half the price of the former. Of this kind, therefore, I have not judged it necessary to send any,—the loose pieces in the cask being all of the first quality; and as I thought it might be agreeable to the Committee to have some specimens of chrystallisations of this mineral, you will find various sorts enclosed in paper in the upper part of the cask, some of which are very beautiful and rare.

With regard to the situation of the Manganese mine, I have little to say that

that would afford either instruction or amusement; only I would observe, that the *bed* of veins seems to run through a large tract of country, but discoverable only by their proximity to the surface; and this bed, extending seven or eight miles in the direction from South to North, commences at the banks of the Don, and proceeds in that line to the sea, where it is found in the form of black sand, and sometimes in pretty solid masses. In this state, however, it would be very unfit for the bleaching process, as I apprehend more than double the bulk would be required to produce the necessary oxygenation of the acid, and of course a certain loss must be brought on by filling the still with heterogeneous matter—not to mention the waste of fuel required to heat such matter, and above all the difficulty of stirring so much solid matter in the still, by which the agitator is very soon broken, and the process rendered un-

productive, or the still destroyed. But although this sand-like Manganese may not be useful in this particular process, yet I have reason to think, that at no very distant period it may be found so in several arts of no less importance; and I hope to be excused from hazarding my opinion on two of these, wherein it might be used to considerable advantage. The first is, in the manufacture of earthen-ware; and next, in that of glass: the former of which requires more of this semi-metallic oxyd than all the other applications of it put together, although of less purity, and then chiefly as a colouring matter. But in regard to the latter, the chief purposes for which it is required are of a very different nature, and more nearly resemble the bleaching process; at least its effects upon that beautiful compound warrant my saying so; and accordingly we find that only the finest quality of Manganese will answer for the purposes of the glass-maker,

or

or such as contains the greatest quantity of oxygen, and at the same time the oxyd of no other metal; for it is well known that most of these afford all the beautiful variety of colour to be perceived on enamelled articles, as well as the different tinges of glass manufactured at different places, such tinges being acquired by some metallic particle, that might be, and is always contained or mixed in the sand of which the glass is composed; and by the addition of a small quantity of pure oxyd of Manganese to the glass infusion, it very soon becomes colourless; a little more gives it a violet or purple colour, and a little more renders it quite black. Now, I conceive, that if a due proportion of this black sand, with that of the other two articles, were melted together, a very fine and cheap glass might be made, and even with less trouble than the method now practised, but not having had any experience in the mi-

nutiæ of this manufacture, so as to enable me to speak decisively on the subject, I hope the Committee will pardon what I have advanced, should it be found inaccurate, or not strictly conformable to the ideas of the operator; or at any rate impute it to my zeal for the promotion of every branch of manufacture, which I consider so immediately connected with the views of the Society for the Encouragement of Arts, &c. &c.

Having taken a cursory view of the progress of the Manganese through the grounds in the vicinity of Aberdeen, that have fallen under my inspection, it is now proper that I should say a few words in regard to other parts a little more distant, confining myself entirely to the county of Aberdeen; but from what was said before, little is to be expected. However, in the course of my peregrinations, I have now and then picked up some specimens of this mineral,

neral, and having always considered it as the most extraordinary substance in nature, merely from its usefulness to me in the prosecution of my chemical studies (or rather I should say amusements), I have been led to search after it more minutely than perhaps I otherwise should have done, and yet, after all, nothing very remarkable has appeared to indicate its presence in any particular spot; for the whole of the ground where this mineral is to be got, abounds with granite, and, what is very remarkable, in one part of this chain or bed of veins, an immense rock of granite of the reddish kind, has its interstices filled with very pure manganese oxyd, in the chrystallised state, specimens of which you will find in the cask; but the quantity to be procured is so small, as to render it unprofitable in working. I mention these circumstances merely to confute a commonly received opinion, "that where granite abounds, metals

are not to be found," and also that I am right as to the direction of the veins of it; for among several rocks, exactly in the same line before stated, and not less than five miles South from the banks of the Don, the crevices of the stones are filled up with, or rather they would seem to be cemented and joined together by, a very thin stratum of Manganese.

Having said thus much in regard to the situation of the Manganese as it occurs in this part of the island, it is necessary that I now say something in respect to its quality; but as my opinion might not be satisfactory, I shall, in the first place, copy a part of a letter from Messrs. Tennant, Knox, and Co. of Glasgow, who are manufacturers of the bleaching liquor and bleaching salt, and supply a great part of the bleachers in England and Scotland with those articles. Their opinion, therefore, cannot fail of being satisfactory, and the more so

so as it was given unsolicited: it is as follows:

"It gives us pleasure to be able to observe to you, that after a full trial, we found your Manganese equal to that either from Devonshire or America; and had we not had a very large stock on hand at the time, we should have gladly treated with you for a quantity."

And next I enclose a Certificate from Mr. James Ferguson, manufacturer and bleacher in this place. It is, therefore, unnecessary for me to say more on the subject, as I conceive its oxygenating power quite equal to any other that has hitherto been procured elsewhere.

As you say that the Committee would be glad to hear every particular respecting this very singular substance, I have taken the liberty of putting among the rest of the parcels, one marked "*Iron.*" On opening the same you will find two pieces of native iron. No. 1 was found in the centre of a lump of

of Manganese, and is pure malleable metal; a circumstance of no small curiosity; and as such I have taken the liberty of presenting it to the Society. No. 2. is a piece of highly magnetic iron, found in considerable quantity in the vicinity of this place. It seems to be in the state of cast-iron, but has nothing else remarkable about it, than that it was found on the same estate where the manganese is procured, and very near the surface of the earth.

The other substance in the same parcel, (which I have not examined), appears to be chrystallised hæmatite, and is found in considerably large masses above the manganese, not less than four feet; the intermediate space being generally filled up with a kind of earth or clay of a reddish colour, in which is found many detached pieces of good manganese, that is, before coming to the first vein, and on passing through it, a stratum of decomposed granite of different

different degrees of thickness, or a kind of schistus, is to be met with, before coming to the next vein. In this manner it proceeds; but how far, I have never been able to ascertain, on account of the quantity of water that rises when at a certain depth. Upon finding the water rise, the workmen proceed horizontally, without being at the trouble to pump out the water; finding it easier to work in this way than otherwise.

Having taken the liberty of stating all that I at present recollect respecting this singular substance, I would yet trespass a little on the time of the Committee, by stating a process not hitherto known, but which may be of considerable importance to the public, namely,

A Method of separating the pure from the base Metals.

Hitherto this process has always been, as far as I have understood it, attended with

with considerable difficulty in the execution; but, by that which I am about to describe, is done with exact certainty. It was discovered and communicated to me by a gentleman in this neighbourhood. The process consists in mixing, not less than two parts of powdered Manganese with the impure or compound metal, which should be previously flattened or spread out, so as to expose as large a surface as possible, and broken or cut into small pieces, for the convenience of putting the whole into a crucible, which then is to be kept in a sufficient heat for a short time. On removing the whole from the fire, and allowing it to cool, the mixture is found to be converted into a brownish powder, which powder or oxyd is then to be mixed with an equal proportion of powdered glass, and then submitted in a crucible to a sufficient heat, so as to fuse the whole, when the perfect metals are found at the bottom in a state of extreme

extreme purity; a circumstance of no small importance to the artist and the chemist; the latter of whom will find no difficulty in separating the one from the other, with so little trouble compared with the former process, that I have no doubt it will always be practised in preference to the cupel.

Description of a Machine for cleansing Manganese.

I shall now conclude these observations, with the description of a very simple machine, invented by me, for washing and cleansing Manganese; by which means two men more effectually pick and clean a greater quantity than ten men could have done without it. But previous to my so doing, it may not be improper to state the method which is at present practised in Devonshire; from thence a more accurate idea will be formed of its utility. It consists in throwing

throwing a quantity of the mineral, coated as it were with clay and other matter, into a wooden trough or box (from six to eight feet long, two feet broad at bottom, but a little wider at top, which is open, and about a foot and a half deep), which is filled with water; the workmen then, by means of shovels, work the whole together, so as to dissolve or suspend in the water the lighter or adhering particles, which, by means of a hole and a plug adapted at the bottom of the trough, are allowed to run off at pleasure. After this, fresh water is added, and the same process repeated again and again, until the Manganese appears perfectly clean.— By this process, therefore, it will appear that much time must be consumed in these different ablutions; and that the working or turning over of such a heavy article by a spade or shovel, must constitute a very important charge in the preparation of the material. As it must likewise

likewise be the desire of every individual, as well as the professed design of the Society of Arts, &c. to lessen the expense of manual labour, in every instance where it can with propriety be followed, I am emboldened to lay the following sketch of the Machine before the Committee, and which I have no doubt may be applied to a variety of other purposes in the *washing* or *cleaning way*.

[The author here describes a machine exactly similar in structure to Mr. Curwen's Machine for washing Potatoes, described in Vol. xxi. p. 203, of Transactions of the Society of Arts, &c. in which two Engravings of it are given, excepting only that the author, where Mr. Curwen employs a perforated barrel, makes use of a cylinder composed of iron bars almost touching each other.]

When this instrument is to be used, the box or trough should be filled with water, and the door, which forms a portion

tion of the circumference of the cylinder, is to be laid open. A quantity of the material is then to be thrown into it; after which, the door or opening is to be shut and secured by means of an iron rod passing through two eyes in the ends of it. When so prepared, all that is necessary to be done, is to turn the machine for a few minutes, which completely separates, and washes off all the foreign particles. Now as the material to be washed is by no means light in comparison of its bulk, and as the cylinder itself is of considerable weight, it is needful to employ two men, that is, one at each handle, not because the strength of one man is insufficient to turn the instrument, but that it is necessary to remove the cylinder with its contents from the trough to a wheelbarrow, or otherwise, in order to empty the Manganese so prepared or washed; after which the cylinder is again placed on the bushes in the trough, and the same

same process repeated with a fresh quantity, as just now described.

It will no doubt occur to you, or any one who considers this instrument for a moment, that I am very deficient in many little contrivances that might be added to it; for instance, I have mentioned the weight of the cylinder and its contents as quite sufficient for the strength of two men: but it was my original idea to have placed a crane, or rather a lever placed on the top of a moveable perpendicular shaft, attached to one side of the box or trough, and by means of a chain connected with each extremity of the cylinder, to have lifted it out of the trough, and emptied its contents with the assistance of only one man.* As I, however, found on trial, that it answered so far beyond my expectations, I have never thought on

* Mr. Curwen's Machine already referred to, answers the object here alluded to by the author.

any further improvements than merely placing two upright pieces of wood, at a little distance from the trough, with a notch in each, for the purpose of receiving the extremities of the axis of the cylinder, and thereby admitting of its being more easily emptied on the ground, or otherwise.

From the hasty sketch now given, I hope the Committee will be able to form a just idea of this simple apparatus; and I cannot help again repeating the probability of its being of great use in many cases in life; one in particular just now occurs to me, and that is, the cleaning of feathers for bedding, where I conceive it might be used with the greatest advantage, instead of the method at present practised of beating them. In this case, however, the instrument might be altogether made of wood, the interstices considerably narrower, and the cylinder larger in diameter. But as I have deviated so widely

widely from my original intention, when I began this letter, by mentioning things somewhat unconnected with the purpose of this communication, I have only now to crave the indulgence of the Committee for so doing, and hope that if any thing be contained in this too long letter worthy of their attention, they will have the goodness to excuse the irregularity of method with which I put my thoughts on paper.

I have the honour to be,

SIR,

Your most obedient Servant,

WILLIAM DYCE.

Aberdeen, June 1, 1803.

CHARLES TAYLOR, Esq.

CERTIFICATES accompanied this Letter, from Messrs. Tennant, Knox, and Co. of Glasgow, preparers of oxygenated muriatic acid, stating,—that

Dr. Dyce's Manganese is equal to that either from Devonshire or America; and one from Mr. James Ferguson, of Aberdeen, testifying it to be as good as that obtained from London, which cost about £10 per ton.

The

The GOLD MEDAL of the Society was this Session voted to Mr. MATTHEW GREGSON, of Liverpool, for his very great attention to render useful the Articles remaining after public Fires. The following COMMUNICATIONS were received from him, and he has also favoured the Society with Impressions from a Wood Engraving, printed with Ink made from such burnt Articles; which Engraving is annexed. Specimens of the Applications of the burnt Materials to various purposes, referred to in this Account, are placed in the Society's Repository for the inspection of the Public.

SIR,

FEELING as I do for the sufferings of many of my townsmen and friends, on account of the dreadful fires

that have lately happened in Liverpool, I am anxious to make myself useful to them, and not unworthy of the notice and regard of the Society for the Encouragement of Arts, &c. I had the honour to be introduced to this Society by a friend, in the year 1801, and was much gratified by the laudable public spirit which that Society displays in promoting the interests of mankind. Upon being presented, at their Meeting, with a piece of paper made of *straw* or *paut*, I was greatly impressed with an idea, of *how much might be made of many articles apparently of no value.* This idea I have never lost sight of since, and in consequence of it now trouble you with these papers.

I was not present at the dreadful fire in Liverpool, in September last, when so many large warehouses were burnt to the ground, and the greatest part of their contents destroyed to an immense amount, as will be shown hereafter; but

but I have herewith enclosed as correct a list as I could obtain, and I believe nearer the truth than any that has yet been made public.

I returned home about ten days after the accident; the ruins yet smoking, and the articles still burning. The first time I went to the spot, I collected the following specimens, a part of which accompany this letter. I wish I had collected a greater quantity; but the present will, I trust, be sufficient to establish the facts I have to offer.

No. 1, is burnt Sugar, marked S. B. or Sweet Black.
2, is burnt Wheat, ——— V. B. or Vegetable Black.
3, is burnt Rice, ——— R. B. or Rice Black.
4, is burnt fine American Barrel Flour.
5, is burnt Cotton.

These are accompanied with an account of the amount and sales of the damaged articles of every description, which produced, as nearly as can be estimated, £13,050. 2s. 0d.

I have likewise attempted an estimate of what might have been still further saved to individuals, and to the public, to *Insurance Offices*, &c. &c. if the plan I have since formed had been then adopted. On the article of grain only, I estimate the saving to be forty-four thousand pounds more than was recovered, which is far more than three times the sum on this one article alone; and I conclude this saving to be nearly as much again upon rice, sugar, molasses, cotton, coffee, hemp, &c.

Fully impressed with this idea, I wish to make known for the public benefit, through the medium of this honourable and distinguished Society, to whom artists, manufacturers, agriculturists, and the commercial world owe so much, my invention for converting those ruins after a fire to the most useful purposes, preferring, as I do, any *honorary* reward the Society may confer upon me, to any pecuniary emolument which I might

might obtain by the concealment of a *simple* experiment.

The simplicity of the conversion of a useless to a valuable article will be highly approved, as I conceive, by the Society. It will require but few words to explain it; for, like the egg experiment of Columbus, it need but be pointed out to be understood. That it was not thought of before, is to me astonishing; and I very much wonder, that hundreds who saw the ruins did not attempt something for the recovery in part of this valuable property, which was consigned to the dunghill, or carried away by the tide.

No. 1.—The burnt sugar was reduced to a fine powder, and was tried as a water-colour paint. A specimen is enclosed, marked at the corner S B. As a *varnish ground* it is used, and marked S B; but as an *oil colour* it is used upon mahogany, and the sample marked S. It was again tried as a *printing-ink*.

Specimens

Specimens of this also are enclosed, and of a wood-cut of Bewick's, with a dedication to the Society.

No. 2.—Burnt wheat was only reduced to a fine powder. *Water-drawing* is marked V B. *Varnish colour* is grounded, marked on the back V B. Oil colour marked V on mahogany; and as a printing ink marked V B.

My painter not having the least knowledge of what he was using, gave it as his opinion, that either of them are preferable to ivory or lamp-black; that they have a good body in oil, and spend freely in water.

He likewise further states, that the vegetable black, as I call it, is of a stronger body, and of the two, is the best black in oil, being a solid good colour, and drying very rapidly. He prefers the S B, or sweet black, in varnish; and in water, he conceives it to be a better, warmer, and richer colour than any Indian ink he ever used; and

it

it much resembles that article, working full as freely, and spending equally well.

Among these specimens, that marked R B dries better than that marked V B. There are also larger specimens of that article sent, these having been collected from a later fire than the Goree fire.

No. 4 is a specimen of American fine flour, which when dug up was in the form of the cask, the same being burnt, and the flour left brown. The first piece I saw I thought was stone. I have converted a part of it into brown powder for hair, which is not very fashionable at present, or it would have answered. However, contrary to my expectations, on pounding it fine, and boiling it in water, I find it makes an excellent paste. It will also answer all the purposes of paste for manufactories. This was really quite contrary to my expectations. I have pasted some tea-paper over an old newspaper, and enclosed

closed it, which will prove my assertions to be good.

Some of the grain was not sufficiently burnt, for it fermented, when carried to the dunghill; but I have no hesitation in affirming that the timber and charcoal on the premises was sufficient to have calcined the whole of the grain in a manner suitable for a basis for black *water colour*, *varnish-black*, *black oil colour*, or *printing ink*, to all which purposes the materials are so very applicable, and so easily converted.

That corn, when charred, is incorruptible, is a fact that was known to the ancients; and if so, there can be little doubt but the colour will be durable. It is not in my power to say whether it may be used for dying; but I am inclined to think that the Chinese make Indian ink of rice, or some vegetable black.

I have yet made no experiments on the cotton, being so actively employed in

in my own business. I have sent a sample, and have some intention of trying how far I can succeed with that, and rice, which I have tried in water colour only.

I shall be glad to be honoured with a letter from you, and to be informed, if what I have written and sent is approved by the Society.

I am, Sir,

Your most obedient servant,

MATTHEW GREGSON.

Liverpool, March 15, 1803.

CHARLES TAYLOR, Esq.

SIR,

I HAVE sent by Higginson's waggon, on the 21st inst. fourteen lbs. of burnt Rice, also some sweated Rice, and burnt Cotton; the first, I am informed, will cost at the utmost 8s. per cwt. for grinding. Manganese is ground here for

for the bleachers use, at 30s. per ton, which I presume is a harder substance. I have enclosed you a sample of Manganese so ground.

My painter tells me, that for the representation of oak, he knows no colour equal to B, without any figuring or dashing of which, as a glazing colour upon a white ground, it is very applicable.

This will be best exemplified by a sample painted on a board marked B, on which there are three patterns painted, all produced from burnt rice, more or less burnt, or more or less covered on.

R B is rice black, S B is sugar black, V B is wheat black, the plain board is V B varnished, and Mr. Thomas Gill's letter accompanies the board; he made the Water Sketches I before sent, but knows not the composition of any of the colours. We have frequent cargoes of grain and flour destroyed, or rendered of little value, in long voyages, by heating;

ing; the value of these may be increased by a conversion to these useful purposes, and the drying quality will recommend their use, as lamp-black is much objected to for being a slow drier.

I am, Sir,

Your humble Servant,

MATTHEW GREGSON.

Liverpool, April 26, 1803.

CHARLES TAYLOR, Esq.

SIR,

HAVING made the necessary trials in oil and varnish, with the samples of black you sent me for that purpose; it appears to me, that the black marked V B on the pattern-board is the best both in point of colour and quickness of grinding. In strength of colour it equals the ivory-black now in use, and is superior to the lamp-black; with regard to body, it is much greater than the former, and at least equal to the latter

latter colour; it likewise dries well, and will be perfectly hard in eight hours with good boiled oil; in this point it is superior to the lamp-black, the latter being a very slow drier, and occasioning much trouble to the consumer; in short, when well pulverized and cleansed, it will in my opinion prove a great acquisition to the trade, provided it can be manufactured cheap enough to come into general use. The other blacks, S B and R B, possess nearly the same properties, but are deficient in colour; they might, however, come into use as preparatory colours to any dark-coloured work.—The brown appears capable of a still farther improvement by sifting, washing, &c. as it contains gritty particles, that render it very difficult to grind; and when ground and spread out by the brush, these particles are visible on the surface, which gives it a sandy appearance. It can only be made use of as a glazing colour, owing to want of body;

it

it has, however, a good d ing quality, and might often be substituted for the Terra de Sienna, when cleansed from the particles alluded to above.

I have likewise made trials of the blacks as water-colours, and find the S B preferable to the rest; it is a very good warm colour for a wash, and works very free. For mellowness of tint, I think it equal to Indian ink.

The brown is also an excellent wash, of a good tint, working very fine; but seeming to want strength, it may be improved in this way, when cleared from the sandy particles mentioned above, as they at present hurt its lustre and diminish its strength.

I remain, Sir,

Your obedient Servant,

THOS. GILL.

Feather-court, Richmond-row,
Liverpool, April 26, 1803.

To Mr. MATT. GREGSON.

The following CERTIFICATES were also received:—

From Mr. W. Redmore Bigg, No. 123, Great Russel-street; stating, that he had sent a slight painted sketch as a specimen of it; that it appears to him a strong and deep black, and he thinks stronger than ivory-black; that it works free, and produces a clean and clear colour with white, and no doubt will work equally well with other colours; that he has used the drying oil with it, and it dries very well.

From Mr. J. B. Brooks, No. 21, Old Bond-street; stating, that having printed some paper in the usual manner of paper-staining in size, with the simple black marked V B, he found it to be a better colour than blue-black or lamp-black, which are generally used, and he thinks it will answer better for printing than either; has sent some of the

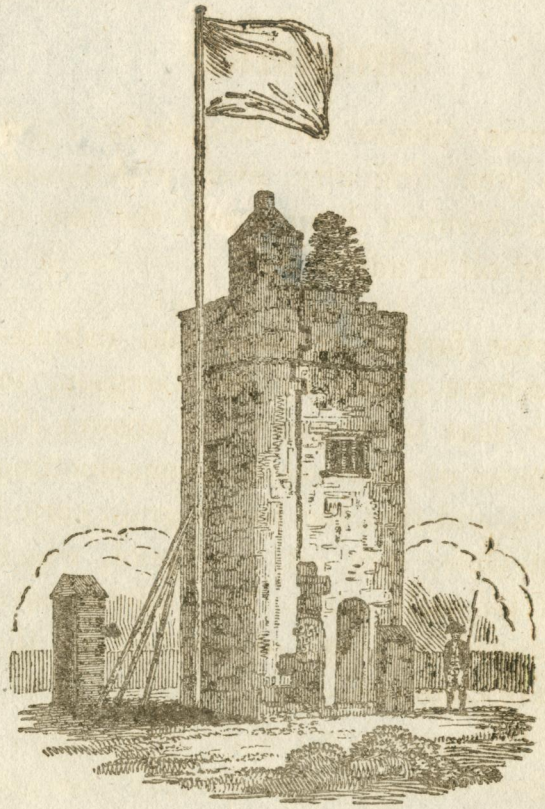
the paper printed with Mr. Gregson's sample.

From Mr. John Tootle, paper-stainer; stating, that the vegetable-black, sent him by Mr. Gregson, would answer every purpose for a black in their manufactory, and particularly so for laying grounds for black borders; as it has more body than lamp-black, and will cover the ground with one colouring, but that with lamp-black they are obliged to colour twice.

From Mr. Henry Buckley, No. 161, Strand; stating, that on trial of the black produced from burnt wheat, he found it to possess a much stronger body than the generality of blacks now in use; and that it has an additional valuable property of drying without any other auxiliary than the boiled oil in which it is ground; that this quality adds considerably to its utility, as the

common blacks are frequently dried with great difficulty, even with two or three chemical dryers, and the use of boiled oil in addition.

Some farther remarks and calculations were added by Mr. Gregson, to show that burnt grain will answer the purposes of charcoal in various smelting works, and that the burnt grain carted from Goree fire, at Liverpool, which sold for only £322. 14s. would have produced £10,000, if applied to the uses of charcoal.



M. G. del. *H. H. sc.*

THE ANCIENT FIRE-BEACON,

NEAR LIVERPOOL.

This Specimen is printed by J. M'Creery of Liverpool, with Ink made from Corn, burnt at the Great Fire in Liverpool, September, 1802.

The above Engraving has been executed for the intended History of Liverpool.

The GOLD MEDAL of the Society was this Session adjudged to Dr. JAMES HOWISON, for his Preparation of TAN, made in the East Indies from the BARK of the MANGROVE TREE. The following COMMUNICATION was received from him, and SPECIMENS of the Preparation are placed in the Society's Repository.

SIR,

I REQUEST the favour of your submitting to the inspection of the Society the preparation of tan, contained in the accompanying barrel, weighing fifty-four pounds.

I entertain hopes, that from its concentrated form and cheapness, it will fully answer the expectations of the Society, and that they will consider me as entitled to the Gold Medal offered by them for that preparation.

The enclosed bills of lading will, I hope, be sufficient documents of one

hundred and ten pounds having been prepared by me. The specimen of fifty-four pounds, now sent, cost me about eight shillings in Bengal; but if the demand for the article be considerable, it could be procured for ten shillings the hundred weight.

The method followed by me in its preparation being very simple, and such as is applicable for extracting the tanning principle from vegetables on the most extended scale, I hope that a short account of it will be acceptable to the Society.

In extracting the tanning principle from the Mangrove Bark, I made use of part of an apparatus which I had formerly employed in refining saltpetre.

This consisted of four wooden cisterns, resembling the coolers used in brew-houses, fitted with cocks, and sufficiently elevated one above another, to admit of any liquid, contained in a higher cistern, running off into that immediately under it, on turning the cock.

In

In preparing the tan forming the specimen sent, I, according to the principles laid down by Mr. Seguin, divided four hundred pounds of Mangrove Bark (broke into small pieces), into three equal parts, one of which was thrown into each of the three highest cisterns.

To the Bark in the uppermost cistern one hundred gallons of rain water was added, which was allowed to remain for twelve hours. The infusion was then drawn off into the second, and after standing for a similar period into the third, and lastly into the fourth, which had been kept empty to receive the saturated infusion, to be farther concentrated by evaporation. The cocks belonging to each cistern, when once turned, were left open to admit of the infusions draining off completely.

The whole of the liquid now collected into the evaporating cistern was exposed to the heat of the sun, until concentrated so as to resemble thick syrup, at which time the lixivium was reduced

to about eight gallons. It was then drawn off clear from its precipitate into a copper boiler, in which it was boiled on a slow fire, and kept constantly stirred, until the extract acquired a consistence that would just admit of its being poured into the barrel, where on becoming cool it had the appearance of pitch, which it still retains. When the infusion had acquired the thickness of syrup, I found the use of fire, for giving the necessary consistence to the extract, preferable to waiting the farther progress of evaporation, that being in a great measure suspended by the successive formation of tough coats on the surface of the liquor.

I have the honour to remain,

SIR,

Your most obedient servant,

JAMES HOWISON.

No. 332, *Strand,*
London, April 28, 1804.

CHAS. TAYLOR, Esq.

Dr.

Dr. Howison has made a similar extract from Myrabolans, which is likely to be extremely useful, both for tanning and dying.

The SILVER MEDAL of the Society was this Session voted to J. MACHLACHLAN, Esq. of Calcutta, for his information on the MINES and MANUFACTURES of the EAST INDIES.—The following COMMUNICATION was received from him, and SPECIMENS of the TALC are preserved in the Society's Repository.

SIR,

SHOULD you think the enclosed Receipts for dying the beautiful Reds of the Coromandel Coast can be of any use to the dyers of the United British Kingdom, be pleased to lay them before the Society for the Encouragement of Arts, &c. that they may be published in the Volume of their Transactions; if not, I trust you will excuse my troubling you with them. They were sent to me from Madras by a scientific

entific friend, who had the several operations, detailed in them, performed in his own presence. I forwarded a copy of them, and a small quantity of the ingredients mentioned in them, to a friend at home, several years ago; but he dying about or soon after the time of their arrival, I never learned what became of them. It strikes me, however, that there is a considerable coincidence between the thread process and that which I have seen recommended by Mr. Henry, of Manchester, for dying the Adrianople or Turkey red.

I am not certain whether it is known at home, that many of the hills in Bahar, and other parts of India, contain immense quantities of mica, talc, or Muscovy glass. The natives of this country and China make very splendid lanterns, shades, and ornaments, of it, tinged of various fanciful colours; and it is also used by them in medicine. When burned or calcined, it is, Iam told, considered

sidered as a specific in obstinate coughs and consumptions. When powdered, it serves to silver the Indian paper, &c. used in letter-writing; and, in fact, it is applied to numberless purposes.—The bazar price of that of the best quality, split into sheets of about two lines thick, is six rupees the maund of 84lb. avoirdupois. If it could be applied to any useful purpose at home, it might go in part ballast of ships, and at a trifling expense. I enclose a small specimen of it, and am,

SIR,

Your very obedient Servant,

J. MACHLACHLAN.

Calcutta, Oct. 4, 1803.

N.B. The chaya, or red dye root of the Coast, is, I believe, known at home; as also the cashaw leaves, which are used as an astringent.

CHARLES TAYLOR, Esq.

Directions

Directions for dying a bright red, four yards of ¾ Broad Cotton Cloth.

1st. The cloth is to be well washed and dried, for the purpose of clearing it of lime and congee, or starch, generally used in India for bleaching and dressing cloths; then put into an earthen vessel, containing twelve ounces of chaya or red dye root, with a gallon of water, and allow it to boil a short time over the fire.

2d. The cloth being taken out, washed in clean water, and dried in the sun, is again put into a pot with one ounce of myrabolans, or galls coarsely powdered, and a gallon of clear water, and allowed to boil to one half: when cool, add to the mixture a quarter of a pint of buffalo's milk. The cloth being fully soaked in this, take it out, and dry it in the sun.

3d. Wash the cloth again in clear cold water, and dry it in the sun; then immerse

immerse it into a gallon of water, a quarter of a pint of buffalo's milk, and a quarter of an ounce of the powdered galls. Soak well in this mixture, and dry in the sun. The cloth, at this stage of the process, feeling rough and hard, is to be rolled up and beetled till it becomes soft.

4th. Infuse into six quarts of cold water, six ounces of red wood shavings, and allow it to remain so two days. On the third day boil it down to two-thirds the quantity, when the liquor will appear of a good bright red colour. To every quart of this, before it cools, add a quarter of an ounce of powdered alum; soak in it your cloth twice over, drying it between each time in the shade.

5th. After three days wash in clean water, and half dry in the sun; then immerse the cloth into five gallons of water, at about the temperature of 120 degrees of Fahrenheit, adding 50 ounces of powdered

dered chaya, and allowing the whole to boil for three hours; take the pot off the fire, but let the cloth remain in it until the liquor is perfectly cool; then wring it gently, and hang it up in the sun to dry.

6th. Mix intimately together, by hand, about a pint measure of fresh sheep's dung, with a gallon of cold water, in which soak the cloth thoroughly, and immediately take it out, and dry it in the sun.

7th. Wash the cloth well in clean water, and spread it out in the sun on a sand-bank (which in India is universally preferred to a grass-plat) for six hours, sprinkling it from time to time, as it dries, with clean water, for the purpose of finishing and perfecting the colour, which will be of a very fine bright red.

J. MACHLACHAN.

Calcutta, Oct. 4, 1803.

CHARLES TAYLOR, Esq.

Directions

Directions for dying of a beautiful red, eight ounces of Cotton Thread.

1st. Put one gallon and a half, by measure, of sap-wood ashes, into an earthen pot, with three gallons of water, and allow the mixture to remain twenty-four hours to perfect it for use.

2d. Put the following articles into an earthen pot, viz. Three-quarters of a pint of Gingelly oil; one pint, by measure, of sheep's dung, intimately mixed by hand in water; two pints of the above ley.—After mixing these ingredients well, pour the mixture gradually upon the thread into another vessel, wetting it only as the thread, by being squeezed and rolled about by the hand, imbibes it, continuing to do so until the whole is completely soaked up, and allow the thread to remain in this state until next day.

3d. Take

3d. Take it up, and put it in the sun to dry; then take a pint and a half of ash-ley, in which squeeze and roll the thread well, and allow it to remain till next day.

4th. Squeeze and roll it in a like quantity of ash-ley, and put it in the sun to dry; when dry, squeeze and roll it again in the ley, and allow it to remain till next day.

5th. Let the same process be repeated three or four times, and intermit till next day.

6th. Ley the thread once, as the day before, and, when well dried in the sun, prepare the following liquor: One gill of Gingelly oil; one pint and a half of ash-ley.—In this squeeze and roll the thread well, and leave it so till next day.

7th. Repeat the process of yesterday, and dry the thread in the sun.

8th. The same process to be repeated.

9th. First repeat the ash-ley process three or four times, as under the operations 3, 4, and 5, and then prepare the following mixture: One pint of sheep-dung water; one gill of Gingelly oil; one pint and a half of ash-ley.—In this squeeze and roll the thread well, and dry it in the sun.

10th. Repeat the same process.

11th. Do. Do.

12th. Do. Do.

13th. Do. Do.

14th. Do. Do.

15th. Wash the thread in clean water, and squeeze and roll it in a cloth until almost dry; then put it into a vessel containing a gill of powdered chaya root, one pint by measure of cashan leaves, and ten pints of clear water; in this liquor squeeze and roll it about well, and allow it to remain so till next day.

16th.

16th. Wring the thread, and dry it in the sun, and repeat again the whole of the 15th process, leaving the thread to steep.

17th. Wring it well, dry it in the sun, and repeat the same process as the day before.

18th. Do. Do.

19th. Do. Do.

20th. Wring and dry it in the sun, and with the like quantity of chaya root in ten pints of water, boil the thread for three hours, and allow it to remain in the infusion until cold.

21st. Wash the thread well in clear water, dry it in the sun, and the whole process is complete.

J. MACLACHLAN.

Calcutta, Oct. 4, 1803.

The THANKS of the Society were this Session voted to Dr. JAMES HOWISON, for the following COMMUNICATION of a METHOD of DYEING or PRINTING a permanent substantive BLACK COLOUR on COTTON GOODS, in the East Indies. A Handkerchief so printed remains in the Society's Repository.

SIR,

ACCOMPANYING this, I send, for the inspection of the Society, a Handkerchief printed with a substantive Black; a discovery which, I hope, will be of some assistance to the improvement of the arts.

The irregularity of the figures is entirely owing to the rude carving of the Indians, as will be seen from some of the flowers being distinctly marked.

As I am much indebted for my success to the hints I received from a perusal

rusal of Dr. Bancroft's very instructive Work on the Philosophy of Colours, I hope the Society will condescend to lay the specimen before him, that his opinion may be known, how far a prosecution of the business is likely to answer the purpose intended.

The printing blocks used were carved by the natives of Bengal, at which place the handkerchief was printed.

I have the honour to be,

SIR,

Your obedient Servant,

JAMES HOWISON.

No. 332, Strand, Oct. 15, 1803.

CHAS. TAYLOR, Esq.

Process for printing on Cotton Cloth a permanent substantive black colour.

Take some Malacca nuts, of which large quantities may be bought in Bengal at 2s. the cwt.; boil them in water in close earthen vessels, along with the leaves of the tree; during the boiling, a whitish substance, formed from the mucilage and oil of the nuts, rises to the surface, which whitish scum must be taken off and preserved.

The cloth, where intended to be black, must be printed with this scum, and then dried; the cloth is afterwards to be passed through lime-water, which changes the printed figures on it to a full and permanent black.